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# Quality requirements for supplies of Special Processes

## SUMMARY:

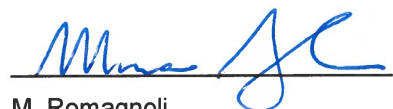
This document describes the specific quality requirements for supplies of Special Processes to the Leonardo S.p.a. Defence Systems Business Unit.  
General quality requirements for supplies to Leonardo-SDI are defined in the PQA004-L-IT-D procedure.

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For conformance to original Italian edition



Date: 2022/09/29

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### AMENDMENT RECORD

Rev.	Date	BMSCP	Description	Authors
00	2018/03/15	-	First issue	N. Rosina, C. Pagni, A. Decima
01	2018/10/22	055	<p><u>Whole document</u>: updated ref. to UNI EN 9100:2018;</p> <p><u>Para. 2.1</u>: removed notes for applicability of AQAP-2110, EN-9100, ISO-9001;</p> <p><u>Para. 5.2.2</u>: specified the applicable paragraphs for validation of Welding processes (IC15 and IC18); specified the applicable activities for validation of Bonding/Gluing (IC19) and Impregnation/Resin Treatment processes (IC20)</p>	C. Pagni

Rev.	Date	BMSCP	Description	Authors
02	2022/09/29	760	<p>Changed logo and document code to match new BMS standard;                      Used new template QUA049-T-EN-D rev. 03;  <u>Whole document</u> (changes not traced): Replaced <i>Division</i> with <i>Business Unit</i>; updated ref. to changed BMS codes (e.g. PQA004-L → PQA004-L-IT-D)  <u>Par. 1.3</u>: Changed title; introduced definition of <i>RQF Code</i> and related clauses;  <u>Par. 2.1</u>: Added ref. to AER(EP).P-145, AQAP-2310, UNI EN ISO 2553, UNI EN ISO 10042, UNI EN ISO 5817, UNI EN ISO 17637;  <u>Par. 5.1</u>: Specified that suppliers and sub-suppliers of special processes are to be approved by Leonardo-SDI;  <u>Par. 5.2.2</u>: Changed title and inserted RQF codes in the table;  <u>Par. 5.2.3</u>: Inserted time validity limit for DQP and validity criteria of other certifications held by suppliers;  <u>Par. 5.2.4</u>: Added ref. to requirements of PQA004-L-IT-D for non-conformity management;  <u>Par. 5.2.5</u>: Added criteria for use of suppliers during their qualification renewal; Improved description of step 2 of the Renewal Approval;  <u>Sec. 5.2.7</u>: Added criteria for revocation of DQP.</p>	

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## 1 INTRODUCTION

### 1.1 Purpose

This document specifies the requirements that suppliers to the Leonardo S.p.a. Defence Systems Business Unit (hereafter Leonardo-SDI) shall meet when application of one or more Special Processes as listed at para. 1.2 is required as a (part of a) supply. The document describes the supplier approval and re-approval process and lists the controls and certificates to be produced for Special Process supplies.

General quality requirements applicable to any supplies are specified in Leonardo-SDI PQA004-L-IT-D procedure.

### 1.2 Applicability

This document applies to Type D supplies<sup>1</sup> to be incorporated into the products and/or services for Leonardo-SDI's customers. It also applies whenever a supplier needs to apply a special process as part of Type A, C, E, F or G supplies<sup>1</sup>.

The special processes to which this document applies are:

- a) External Special Processes defined by Leonardo-SDI proprietary standards or by national and international reference standards (e.g. MIL, ASTM, etc.).
- b) Non-Destructive Tests on special processes defined by procedures belonging to Leonardo - Leonardo-SDI or by national and international reference standards (e.g. MIL, AMS, ASTM, etc.).

Leonardo-SDI considers the following to be special processes:

- a. welding and weld-brazing (this also includes: resistance spot welding, not-welded mechanical connections by rivets, crimp, etc.);
- b. heat treatments;
- c. bonding (gluing);
- d. painting;
- e. surface treatments;
- f. wiring of electrical equipment (this includes not-welded electrical connections using crimping);
- g. manual and wave soldering of printed circuit boards; surface mount soldering;
- h. forming composite materials;
- i. Non-Destructive Tests (NDT).

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<sup>1</sup> See definition of types in PQA004-L-IT-D.

### 1.3 RQF Code

As stated in PQA004-L-IT-D, for quality purposes each supply is classified according to a Type (letter) and a Classification Index (number) that depend on the specific characteristics of the supplied products/services.

These two parameters are indicated in the Purchase Order through the RQF Code, which is associated to each Order line and allows the activities and documents required from the supplier to be identified in this document:

**RQF Code = <Type> + <Classification Index>**

For example, **RQF = D5** is associated indicates a Passivation process (Type D, Index 5).

The possible values and meaning of the RQF Code for Special Process supplies are listed below. The related activities and documents required from suppliers are described in Section 5.2.2.

RQF	Special Process	RQF	Special Process
D1	PHOSPHATING	D11	PAINTING
D2	CHROMIC ANODIZING	D12	MASSIVE HEAT TREATMENTS
D3	SULPHURIC ANODIZING	D13	LOCALIZED HARDENING BY HEAT INPUT
D4	ALUMINIUM CONVERSION	D14	STEEL SURFACE ENRICHMENT
D5	PASSIVATION	D15	WELDING
D6	ELECTROLYTIC CHROME PLATING	D16	PROCESS ON COMPOSITE MATERIALS
D7	ZINC-NICKEL	D17	VT-PT-MT-UT-RT NON-DESTRUCTIVE TESTING
D8	CHEMICAL NICKEL PLATING	D18	ELECTRIC WELDING
D9	HARD ANODISING	D19	BONDING (GLUING)
D10	SILVERING	D20	IMPREGNATION AND RESIN TREATMENT

**Table 1 – RQF Code for Special Process Supplies**

## 2 REFERENCES<sup>2</sup>

### 2.1 Documents

Code	Title
<b>Contractual (applicable when required by the PO or the Contract)</b>	
AER(EP).P-145	Requirements for Maintenance Organisations
AQAP 2110 Ed D	NATO Quality Assurance Requirements for Design, Development and Production
AQAP-2310 ed. B	NATO Quality Management System Requirements for Aviation, Space and Defence suppliers
UNI EN 9100:2018	Quality Management Systems-Requirements for Aviation, Space and Defense Organizations.
UNI EN ISO 9001:2015	Quality Management System – Requirements.
UNI EN ISO 3834	Quality requirements for fusion welding of metallic materials
UNI EN ISO 9712	Non-destructive testing - Qualification and certification of non-destructive test personnel
UNI EN ISO 2553.	Welding and allied processes — Symbolic representation on drawings — Welded joints
UNI EN ISO 10042	Welding — Arc-welded joints in aluminium and its alloys — Quality levels for imperfections
UNI EN ISO 5817	Welding — Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) — Quality levels for imperfections
UNI EN ISO 17637	Non-destructive testing of welds — Visual testing of fusion-welded joints
<b>Internal Reference Documentation</b>	
PQA004-L-IT-D	Quality requirements for supplies to the Leonardo-SDI Business Unit
QUA017-T-IT-D	List of approved suppliers of Special Processes/NDT and their supply chain
OTO-RS-1	Manganese or zinc-based phosphating process
OTO-RS-2	Anodizing of aluminium and its alloys (chromic acid process)
OTO-RS-3	Anodizing of aluminium and its alloys (sulphuric acid process)
OTO-RS-4	Passivation process for aluminium and its alloys
OTO-RS-6	Passivation of stainless steels
OTO-RS-8	Electrolytic chrome plating
OTO-RS-10	Electrolytic zinc-nickel coating
OTO-RS-12	Chemical nickel plating process
OTO-RS-13	Control Procedure for Special Processes
SN5260001	Hard Sulphuric Anodizing
OTO-RS-19	Silvering surface treatment
OTO-VE-0	Painting processes for Leonardo-SDI products
OTO-TT-1	Heat treatment of ferrous materials
OTO-TT-2	Heat treatments for surface hardening of ferrous alloys

<sup>2</sup> Standards or publications cited without a revision date or index should be considered for reference in the latest available revision.

### 3 DEFINITIONS AND ACRONYMS

#### 3.1 Definitions

Definition	Description
Special Process	<p>Production process or service delivery, the result of which cannot be verified by subsequent non-destructive monitoring or measuring activities, with the consequence that any shortcomings can only become evident when the product is already in use or the service has been delivered.</p> <p>The special process shall therefore be ensured by means of specific periodic checks which include staff training, verification of the suitability of the installations for the relevant qualification, staff and consumables used.</p>
Assessment	<p>The qualification shall be applied to all factors in the process as defined by the qualification specification.</p> <p>When required, the qualification of new personnel assigned to a special process does not necessarily mean the qualification of the process has to be repeated.</p>
Validation	<p>Verification of conformity of a special process with the applicable technical specifications, based on documented evidence.</p>
Approval	<p>If the verification checks carried out are successful, the result of the evaluation is the confirmation that the process is qualified and is therefore approved for use. Approval is given with the issue of a formal process qualification certificate, called the "Process Qualification Declaration".</p> <p>The qualification certificate may be issued with operational limitations on its use (e.g. the use of the process for certain parts or assemblies).</p>

In addition, the definitions of document PQA004-L-IT-D apply.

#### 3.2 Acronyms

Acronym	Description
BMSCP	Change Proposal for BMS document
CI	Classification Index
DDT	Transport document
DQP	Process Qualification Statement
GQAR	Government Quality Assurance Representative
MCP	Manufacturing and Control Plan (Piano di Fabbricazione e Controllo (PFC))
NADCAP	National Aerospace and Defense Contractors Accreditation Program
NC	Nonconformity
NDT	Non Destructive Tests
PN	Part Number
PO	Purchase Order
QMS	Quality Management System
WPQR	Welding Procedure Qualification Record
WPS	Welding Procedure Specification



#### **4 GENERAL REQUIREMENTS**

The following requirements, as specified in PQA004-L-IT-D, apply to supplies covered by this document:

- General requirements for Suppliers' Quality System;
- Documentation;
- Determining and reviewing requirements;
- Identification and traceability;
- Supply Acceptance;
- Control of nonconforming products;
- Product preservation;
- Right of access and support for the customer and GQAR

## 5 SPECIFIC REQUIREMENTS

### 5.1 General

Suppliers and all members of their supply chain who apply special processes as a (part of a) supply to Leonardo-SDI, shall have been approved in advance by Leonardo SDI as "Special Process Suppliers" and therefore appear on the "List of Approved Special Process Suppliers" (QUA017-T-IT-D).

For supplies of special processes Leonardo-SDI requires:

- **Process Qualification/Certification;**
- **The Process Specification.**

In addition, when a special process is required in the applicable technical documentation, the following requirements shall be met:

- a) The Supplier shall identify the special process by indication on the Manufacturing Control Plan (MCP);
- b) The Supplier shall identify the process characteristics necessary to ensure repeatability under controlled conditions (WPS for welding processes; Operating Cycle with related technical parameters for other processes);
- c) The Supplier shall indicate in the MCP the controls to be carried out at the end of the process, including reference to the applicable procedures;
- d) Special Processes, including those of any sub-suppliers, shall be validated prior to application on the supplied products by appropriate verification and subsequent PFC approval,
- e) Special Processes shall be periodically re-validated (frequency indicated in the DQP);
- f) If the Supplier is the Design Authority of the supplied product/service, formal approval by Leonardo-SDI is not required; the Supplier may use his own special processes as long as he provides evidence of an effective control of his supply chain and validation and periodic re-validation of the special processes.

#### 5.1.1 Process Qualification/Certification

Process qualification or certification (by a recognised third party or company whose quality standards are known, appropriate and accepted by Leonardo-SDI) means the set of activities that are necessary to demonstrate that a manufacturing process is capable of meeting the requirements specified in clearly identified international standards (such as UNI EN; ISO; DIN; SAE AMS; ASTM, ... etc.).

Qualification may also be conducted by Leonardo-SDI or its trusted agencies.

The Supplier shall submit the qualification and/or certification documentation to Leonardo-SDI prior to the start of the activity.

Any changes to the special process (e.g. changes in certified personnel, infrastructure or sub-suppliers) shall be promptly and formally communicated to Leonardo-SDI.

#### 5.1.2 Process Specification

The Process Specification describes how the supplier implements the requirements of the applicable international standard or, if the process is proprietary, the relevant internal standard. The document details the operational parameters, technical requirements and methodology to control the process in order to meet product quality requirements. The document, preliminarily approved by Leonardo-SDI, shall be available at the Supplier's workstations.

Unless otherwise specified in the drawing and/or order, the international standards referred to in the Leonardo-SDI special process specifications shall be applied.

If the supplier intends to operate using his own specifications which have different reference standards, these shall be submitted to Leonardo-SDI for approval within 30 calendar days of receipt of the Order and in any case before starting the activities.

## 5.2 Approval of Special Processes

### 5.2.1 Initial qualification

The initial qualification of special processes consists of a set of verifications by which a documented body of evidence is collected, necessary to evaluate conformity of a process to the applicable technical specifications.

The verifications shall be applied to all elements of the special process, in accordance with the criteria and methodologies defined in the applicable technical specifications.

Verifications are carried out by Leonardo-SDI according to the following procedure:

	Activity	Method of formalizing activities	Step
1	Verification of documents submitted by the supplier for preliminary assessment and consultation of public domain documentation	None	EXAMINATION
2	Verification of special process conformity (documentary or by audit).  In general, this includes: <ol style="list-style-type: none"> <li>i. Verification of the criteria defined for process review and approval.</li> <li>ii. Verification of requirements specified for quality records.</li> <li>iii. Verification of the plant/equipment efficiency.</li> <li>iv. Verification of compliance with mandatory requirements, with enhanced focus on safety and environment.</li> <li>v. Verification of materials and tools in use.</li> <li>vi. Verification of qualifications of persons doing work.</li> <li>vii. Verification of technical documentation related to the process (applicable technical specifications, methods of implementation, etc.).</li> <li>viii. Verification of plans and frequency of periodic maintenance and renewal of validity.</li> <li>ix. Performance, if planned, of specific controls on the product, for example by means of reference samples (<b>Validation</b>, see Table 3).</li> </ol> The activities require gathering the necessary documentation (e.g. calibration certificates, plant layouts, personnel certifications, qualified WPS, ... etc.).	Checklist Audit plan Audit report Technical dossier Laboratory certificates (if any)	ASSESSMENT
3	Confirmation of process qualification	DQP	APPROVAL

**Table 2 - Approval of special processes**

The supplier status, depending on the activities progress, goes through the following steps:

- a) **UNDER EXAMINATION** Leonardo-SDI has started to review the documents submitted by the supplier
- b) **UNDER ASSESSMENT** Leonardo-SDI has started verification of the supplier process.
- c) **APPROVED:** Leonardo-SDI has acknowledged the supplier's qualification and issued the expected certificate.

Leonardo-SDI reserves the right to approve, without in-depth verification, the process of suppliers already holding certifications issued by an Approved Third Party.

If the Special Process Supplier has certification from an Approved Third Party and Leonardo-SDI's technical documentation requires a special process other than the one indicated in the scope of that certification, an additional verification will be performed by Leonardo-SDI on the process

The supplier shall promptly notify Leonardo-SDI of any loss of stated certifications.

### 5.2.2 Special Process Validation and Supplied Documents

The reference standard for each special process is indicated by Leonardo-SDI in the Purchase Order or the attached technical documentation or the Supply Specification, and shall be applied by the supplier in an integral and mandatory manner.

The table below shows:

- the activities to be carried out during the verification/validation phase, with the relative test pieces to be produced and the controls to be carried out (see column *Tests to be carried out (...)*)
- the minimum documentation the supplier shall deliver upon completion of the activities performed under the contract (see column *Tasks to be performed (...)*).

The following table is not exhaustive; further processes may be included based on the evaluation of Leonardo-SDI.

Leonardo-SDI reserves the right not to perform practical tests if sufficient documentation has been presented proving the quality of the process carried out (e.g. certificates of analysis from accredited laboratories or qualifications from other companies, ... etc.).

Control of the treated test pieces shall be carried out by accredited Laboratories. However, Leonardo-SDI reserves the right to carry out the analyses at his own Technical Laboratory.

RQF	Special Process and Reference Procedure	Tests to be carried out in the Validation/Re-validation phase	Tasks to be performed for each production batch and related documents
D1	PHOSPHATING (Manganese or Zinc based) OTO-RS-1	Production of n° 24 steel panels for: a) <b>phosphate weight determination n° 4 test pieces 50x50x2 mm (n° 2 for Mn, n°2 for Zn)</b> b) <b>for salt spray (fog) test (n°5 for Zn unoled, n°5 for Zn oiled, n°5 for Mn unoled, 5 for Mn oiled)</b>	The <b>Test Report</b> for each batch shall contain: a) <b>Visual inspection;</b> b) <b>Thickness verification of phosphate layer;</b> c) <b>Time/temperature diagram of dehydrogenation (if applicable).</b>
D2	OXIDATION CHROME ANODIZING (Aluminium and alloys) OTO-RS-2	Production of n° 8 test pieces in alloy 2024 or 5083, dimensions approx. 250x80x1 mm for: a) <b>n°5 for salt spray (fog) test</b> b) <b>n°2 for determination of coating weight</b> c) <b>n°1 for determining the coating thickness</b>	The <b>Test Report</b> for each batch shall contain: a) <b>Visual inspection;</b> b) <b>thickness verification of anode layer</b>

RQF	Special Process and Reference Procedure	Tests to be carried out in the Validation/Re-validation phase	Tasks to be performed for each production batch and related documents
D3	OXIDATION SULPHURIC ANODIZING (Aluminium and alloys) OTO-RS-3 SN5260001 §4.1	Production of n°8 test pieces in alloy 2024 or 5083; dimensions approx.. 250x80x1 mm for: a) n°5 for salt spray (fog) test b) n°2 for determination of coating weight c) n°1 for determination of coating thickness	The <b>Test Report</b> for each batch shall contain: a) Visual inspection b) Thickness verification of anode layer c) Certificate of Conformity
D4	ALUMINIUM CONVERSION OTO-RS-4	Production of n°15 test pieces in alloy 2024 or 5083; dimensions approx..250x80x1 mm for: a) n°5 for saline mist, b) n°5 for paint test, c) n°2 for determination of coating weight d) n°2 for presence of dust e) n°1 for successful conversion	The <b>Test Report</b> for each batch shall contain: a) Visual inspection; b) Performance of the spraying test with related result/ successful conversion test on sample plate
D5	PASSIVATION (STAINLESS STEEL) OTO-RS-6	Production of n°9 stainless steel test pieces of approx. 250x80x1 mm for: a) n°5 for salt spray (fog) test b) n°2 for passivity test c) n°2 for determination of resistance to liquids	The <b>Test Report</b> for each batch shall contain: a) Certificate of successful passivation.
D6	ELECTROLYTIC CHROME PLATING OTO-RS-8	Production of n°6 steel test pieces for: a) n°2 for determining the coating thickness b) n°2 for determining hardness c) n°2 for porosity tests d) n°2 test pieces 125x2.5x1 mm to determine adhesion	The <b>Test Report</b> for each batch shall contain: a) Visual inspection; b) Coating thickness verification (mini-test or with dimensions); c) Dehydrogenation diagram when required.
D7	ZINC-NICKEL OTO-RS-10	Production of n°9 steel test pieces for: a) n°5 test pieces or panels 250x80x1 mm for determination of corrosion resistance b) n°2 test pieces or panels 250x80x1 mm for determination of alloy and thickness c) n°2 test pieces 120x2.5x1 mm for determination of adhesion	The <b>Test Report</b> for each batch shall contain: a) Visual inspection b) Verification of coating thickness and alloy c) Dehydrogenation diagram when required.

RQF	Special Process and Reference Procedure	Tests to be carried out in the Validation/Re-validation phase	Tasks to be performed for each production batch and related documents
D8	CHEMICAL NICKEL PLATING OTO-RS-12	Production of n°9 steel test pieces with 50 µm coating for: <ul style="list-style-type: none"> <li>a) n°5 test pieces or panels 250x80x1 mm for determination of corrosion resistance</li> <li>b) n°1 test piece or panel 250x80x1 mm for determination of thickness</li> <li>c) n°1 test piece or panel 250x80x1 mm for determination of alloy (max. coating thickness 20 µm)</li> <li>d) n°2 test pieces 125x2.5x1 mm for determination of adhesion</li> </ul>	The Test Report for each batch shall contain: <ul style="list-style-type: none"> <li>a) Visual inspection;</li> <li>b) Verification of the thickness of the coating on the sample plate with dimensions on the item;</li> <li>c) Dehydrogenation diagram when required.</li> </ul>
D9	OXIDATION HARD ANODIZING (Aluminium and alloys) OTO-RS-13 SN5260001 §4.2	Production of n°10 test pieces in alloy 2024 or 5083; dimensions approx..250x80x1 mm for: <ul style="list-style-type: none"> <li>a) n°5 for salt spray (fog) test</li> <li>b) n°2 test pieces for weight determination</li> <li>c) n°1 test piece for thickness and micrographic hardness</li> <li>d) n°2 test pieces to be submitted to Taber test</li> </ul>	The Test Report for each batch shall contain: <ul style="list-style-type: none"> <li>a) Visual inspection</li> <li>b) Thickness verification of anode layer (with mini test)</li> <li>c) Certificate of Conformity</li> </ul>
D10	SILVERING OTO-RS-19	Production of n°12 steel test pieces for: <ul style="list-style-type: none"> <li>a) n°2 for determining the coating thickness</li> <li>b) n°2 for determining adhesion</li> <li>c) n°2 for determining hardness when required</li> <li>d) n°2 determination of oxidation resistance when required (GRADE A)</li> <li>e) n°2 Weldability when required</li> </ul>	The Test Report for each batch shall contain: <ul style="list-style-type: none"> <li>a) Visual inspection</li> <li>b) Verification of thickness (X-rays);</li> <li>c) Verification of roughness;</li> <li>d) Stress relief and dehydrogenation diagram (when necessary).</li> </ul>
D11	PAINTING OTO-VE-0	Production of n°10 Q-Panels identified as follows: <ul style="list-style-type: none"> <li>a) n°5 x QS46I (Treated steel)</li> <li>b) n°5 x QAL46 (Treated Aluminium) used to determine primer thickness of total package, brilliance and adhesion</li> </ul>	The Test Report for each batch shall contain: <ul style="list-style-type: none"> <li>a) thickness control;</li> <li>b) gloss verification;</li> <li>c) performance of adhesion tests on Q-panel with associated results;</li> <li>d) verification of colour point.</li> </ul>

RQF	Special Process and Reference Procedure	Tests to be carried out in the Validation/Re-validation phase	Tasks to be performed for each production batch and related documents
D12	<p>MASSIVE HEAT TREATMENTS</p> <p>OTO-TT-01</p>	<p>Temporary DQP release and, upon order received, if tempering processes are approved, treatment of a test piece together with the batch for verification:</p> <ul style="list-style-type: none"> <li>a) <b>No cracks</b></li> <li>b) <b>Hardness curve</b></li> <li>c) <b>Mechanical tests</b></li> </ul>	<p>The <b>Test Report</b> for each batch shall contain:</p> <ul style="list-style-type: none"> <li>a) <b>Time/temperature diagram;</b></li> <li>b) <b>Hardness test (if required)</b></li> </ul> <p>For HARDENING and TEMPERING:</p> <ul style="list-style-type: none"> <li>c) <b>Time/Temperature Diagram;</b></li> <li>d) <b>surface hardness;</b></li> <li>e) <b>Where required mechanical tests and metallographic analysis.</b></li> </ul>
D13	<p>LOCALIZED HARDENING BY HEAT INPUT (Induction, laser, flame tempering)</p> <p>OTO-TT-02</p>	<p><b>N.B. Qualification is issued for the tested PN.</b></p> <p>If a new PN is treated, the process shall first be tested on a mockup with significantly comparable geometry and material.</p> <p>The following shall be verified:</p> <ul style="list-style-type: none"> <li>a) <b>Certificate of Integrity assessed by NDT (MT/PT)</b></li> <li>b) <b>Surface hardness</b></li> <li>c) <b>Hardening depth (hardness curve)</b></li> <li>d) <b>Nital etching (photograph of the hardened section(s))</b></li> </ul>	<p>The <b>Test Report</b> for each batch shall contain:</p> <ul style="list-style-type: none"> <li>a) <b>Integrity certificate assessed by NDT (MT/PT)</b></li> <li>b) <b>Surface hardness</b></li> <li>c) <b>Certification of compliance with the cycle performed at the qualification stage</b></li> </ul>
D14	<p>STEEL SURFACE ENRICHMENT (nitriding - cementation)</p> <p>OTO-TT-02</p>	<p>Temporary DQP release and, upon order received, treatment of a test piece of the same alloy and comparable geometry for verification:</p> <ul style="list-style-type: none"> <li>a) <b>Surface hardness</b></li> <li>b) <b>Hardening depth</b></li> <li>c) <b>No cracks</b></li> </ul>	<p>The <b>Test Report</b> for each batch shall contain:</p> <ul style="list-style-type: none"> <li>a) <b>Time/Load Temperature/batch diagram;</b></li> <li>b) <b>Hardness curve, carried out on test piece; part of the test piece to be sent to Leonardo-SDI;</b></li> <li>c) <b>When required, metallographic analysis.</b></li> <li>d) <b>Integrity certificate assessed by NDT (MT/PT)</b></li> </ul>

RQF	Special Process and Reference Procedure	Tests to be carried out in the Validation/Re-validation phase	Tasks to be performed for each production batch and related documents
D15	<p>WELDING ISO 3834</p> <p>This includes welding for resistance spots, non-welded mechanical connections with rivets, crimping.</p>	<p>Document verification, in accordance with the requirements of par. 5.3.1</p>	<p>Activities prior to the start of production:</p> <ul style="list-style-type: none"> <li>a) <b>MCP approval and concurrent verification of applicability of qualified WPS (WPQR) referred to</b></li> <li>b) <b>Verification of welders and NDT operators qualification.</b></li> </ul> <p>Tasks to be performed for each production batch:</p> <ul style="list-style-type: none"> <li>c) <b>MCP application</b></li> <li>d) <b>Completed MCP and related records/evidence;</b></li> <li>e) <b>Records of non-destructive tests.</b></li> </ul>
D16	<p>PROCESSES ON COMPOSITE MATERIALS</p>	<p>Issue of provisional DQP and, upon order received, on test piece samples:</p> <ul style="list-style-type: none"> <li>a) <b>Mechanical tests</b></li> <li>b) <b>Layering</b></li> </ul>	<p>The <b>Test Report</b> for each batch shall contain:</p> <ul style="list-style-type: none"> <li>a) <b>Raw materials certificates;</b></li> <li>b) <b>Mechanical testing (if required by drawing/specification)</b></li> <li>c) <b>Layering (if required by drawing / specification)</b></li> <li>d) <b>Environmental tests (if required by drawing/specification).</b></li> </ul>
D17	<p>NON-DESTRUCTIVE TESTS VT-PT-MT-UT-RT</p>	<ul style="list-style-type: none"> <li>a) Where required, evidence of facilities kept under control and in state of validity.</li> <li>b) Evidence of qualification of the operator issued by a recognised organization and in state of validity</li> <li>c) Test of the test piece provided by Leonardo-SDI (if required)</li> </ul>	<p><b>Test report</b> as required by applicable standards, signed by level II personnel.</p>
D18	<p>ELECTRIC WELDING Including not welded electrical connections</p>	<p>Document verification in accordance with the requirements of par. 5.3.2 and 5.3.3</p>	<p>Activities prior to the start of production:</p> <ul style="list-style-type: none"> <li>a) <b>MCP and process approval</b></li> <li>b) <b>Verification of certification of equipment/welders and assigned operators.</b></li> </ul> <p>Tasks to be performed for each production batch:</p> <ul style="list-style-type: none"> <li>c) <b>Application of MCP</b></li> <li>d) <b>MCP completed with related records/evidences;</b></li> <li>e) <b>Records of non-destructive testing</b></li> </ul>



RQF	Special Process and Reference Procedure	Tests to be carried out in the Validation/Re-validation phase	Tasks to be performed for each production batch and related documents
D19	BONDING (GLUING)	a) Verification of Process Specification; b) Verification of applicable test procedures; c) Execution of test piece samples (quantity and characteristics depending on the supply requirements)	Provisional activities prior to start of production: <b>a) MCP approval</b> <b>b) Verification of certification of plants/operators assigned to preparation glued joints.</b>  Tasks to be performed for each production batch: <b>c) MCP application</b> <b>d) Completed MCP and related records/evidence;</b> <b>e) Records of non-destructive testing</b>
D20	IMPREGNATION AND RESIN TREATMENT	d) Verification of Process Specification; e) Verification of applicable test procedures; f) Execution of test piece samples (quantity and characteristics depending on the supply requirements)	Preliminary activities at the start of production: <b>a) MCP and process approval</b> <b>b) Verification of certification of the personnel involved.</b>  Tasks to be performed for each production batch: <b>c) MCP application</b> <b>d) Completed MCP and related records/evidence;</b> <b>e) Records of non-destructive testing</b>

**Table 3 - Validation Tests and Supply Requirements**

**5.2.3 Issue of the Process Qualification Declaration (DQP)**

Successful completion of the activities described in Tables 2 and 3 determines the approval of the special process supplier, its inclusion in the "List of Approved Special Process Suppliers" (QUA017-T-IT-D), and the issue of the Declaration of Process Qualification (DQP).

The DQP may be exhibited at the supplier's production site and shall be available at the workstations involved in the process.

The DQP states:

- the type of special process and any limitations;
- the types of controls to be performed on the process/product;
- international or Leonardo-SDI's reference standards, expiry date and terms for periodic re-validation.

The DQP has a time-limited validity, defined in the DQP itself, which depends on the type of process or audit outcomes.

If the supplier holds a NADCAP or other Leonardo Division/BU certification, issue of the DQP is not required. The supplier will be included in the "List of Approved Special Process Suppliers" (QUA017-T-IT-D) with reference to the accomplished certification/qualification titles, provided that they comply with the applicable Leonardo-SDI requirements.

Any other certifications issued by Third Party Entities will be evaluated on a case-by-case basis.

**5.2.4 Maintaining the qualification**

In order to verify the preservation of the quality level of the special process, the periodic checks required by the applicable process specifications shall be carried out and documented.

The periodic controls shall comply in type and frequency with those established at the time of qualification.

In addition to records of qualification results, appropriate records of quality controls performed on manufactured products shall be retained for each qualified special process, in accordance with applicable requirements. Preservation and retrieval of such records shall be ensured for the specified period of time.

Leonardo-SDI shall be informed of any changes made to the process.

If a nonconformity occurs, the supplier shall take actions to control and correct it, in accordance with the requirements of PQA004-L-IT-D, and provide evidence to Leonardo-SDI.

In the event of changes in one or more characteristic factors of the process (procedures, plants, equipment, personnel, materials, measurements) a partial re-qualification of the process shall be carried out, limited to the modified elements. For the whole process, the qualification limits already established remain valid.

Any process change introduced without notifying Leonardo-SDI will result in immediate revocation of the DQP.

**5.2.5 Qualification renewal**

The supplier shall provide evidence that it has carried out periodic inspections according to an established plan.

Approval of the special process lasts for 2 years unless exceptions are indicated in the DQP and if no process changes occur.

Renewal of qualification shall be planned within three months of expiration. During the renewal phase, the supplier may be used under the control of Leonardo-SDI and provided that no quality issues arise from the supplied products/services. Once the re-qualification activity is completed, the DQP will report the date of the day following the previous expiration, in order to confirm the supplier's continued operation.

Below is the flow of activities for renewal:

	Activity	Method of formalising activities	Step
1	Upon expiration of the deadline specified on the DQP, Leonardo-SDI contacts the supplier to request readiness to maintain approval.	None	UNDER REVIEW
2	Analysis by Leonardo-SDI of: a) records and periodic controls performed by the supplier (*), to verify the maintenance of the quality level of the special process; b) data related to the supplier (vendor rating, non-conformities, delivery delays, etc.) to assess whether an audit of the supplier's Quality System should be carried out.  (*) subsequent to the date of qualification of the special process or the date of the last renewal.	Check list - Audit plan - Audit report Updating of technical dossier Laboratory certificates (if any)	REASSESSMENT
3	Statement of process approval	DQP	REAPPROVAL

**Table 4 - Renewal of the Approval**

If he has a valid NADCAP (or other Recognised Body) certificate accepted by Leonardo-SDI, the supplier shall submit the updated certificate.

### **5.2.6 Deviation Permits and Concessions**

Any Deviation Permit / Concession from provisions of the DQP shall be submitted to Leonardo-SDI in advance for approval.

### **5.2.7 Revocation or Suspension of DQP**

Qualification will be automatically revoked in the following cases:

- a) If the qualification is not renewed within the specified time limits.
- b) If the process is suspended for periods of time longer than defined in the process specifications.
- c) Relocation of plants, replacement of equipment, major maintenance works, change of materials used in the process.
- d) Changes in the applicable specifications when these prescribe more restrictive requirements.
- e) Decline in the quality level of the special process performance.

Qualification will be suspended in the following cases:

- f) Product nonconformities are detected which depend on the application of the special process;
- g) Major/critical nonconformities are detected during the re-qualification process or maintenance controls.

Any process change introduced without giving notice to Leonardo-SDI will result in immediate revocation of the DQP.

### **5.2.8 Requirements for Personnel**

The qualifications of all personnel assigned to the special process shall be indicated in the DQP.

The supplier shall maintain a list of its qualified personnel, including their certified qualifications with expiration dates, and provide evidence to Leonardo-SDI.

#### Special Process Personnel

In terms of validation, the supplier shall provide evidence of:

- a) Certifications issued by recognised bodies;
- b) Any theoretical and practical training courses performed by personnel assigned to each special process;
- c) Operational continuity of personnel.

#### Personnel assigned to Non-Destructive Tests

For NDT personnel, the supplier shall provide evidence of mandatory qualifications and certifications issued by recognized bodies. The evidence will be attached to the DQP.

## **5.3 Detailed requirements for welding**

### **5.3.1 Requirements for mechanical welding**

Welding process activities, unless otherwise specified in the contract, shall be carried out in accordance with the quality requirements of the UNI EN ISO 3834 series (3834-2; 3834-3; 3834-4), and according to UNI EN ISO 3834-5 intended as a reference for mandatory applicable standards (contains a list of standards that are to be met to declare compliance to the quality requirements of UNI EN ISO 3834).

#### **5.3.1.1 Requirements for control activities**

Weld joints shall be free from not permitted imperfections, as these could impair their use. Acceptance levels shall comply with applicable standards.

Unless otherwise required by applicable drawings or purchase order, compliance with acceptance criteria shall be verified after welding as follows:

- a) By visual inspection according to UNI EN ISO 17637 (imperfections assessment according to UNI EN ISO 5817 - "Medium-C" class for steel arc welded joints; imperfections assessment according to: UNI EN ISO 10042 - "Medium-C" class for joints in aluminium and its alloys arc welded);
- b) By Non-Destructive Test, as per the applicable UNI EN standard, depending on the type of control;
- c) Geometric dimensional control of the weld in accordance with the applicable technical documentation and UNI EN ISO 2553.

The results of controls shall be recorded on the prescribed forms, which shall include the names of the qualified personnel. Personnel in charge of Non-Destructive Tests shall be certified for the type of control in accordance with UNI EN ISO 9712.

The status of post-welding inspections and controls shall be documented and recorded.

### **5.3.2 Requirements for soldering electronic components (soft soldering)**

In order to obtain the required approval, prior to the start of series production, the supplier shall submit documentation to Leonardo-SDI regarding the process application (manual welding, wave welding, surface mount welding).

The documentation shall contain, at least, the following information:

- a) type of alloy and flux used;
- b) methods and timing for cleaning welds;
- c) printed circuit board washing/painting procedures, as applicable;
- d) type of solvent and varnish, as applicable (for operations a/b/c).

The above shall comply with the applicable technical documentation. In addition, in the case of soldering of components sensitive to electrostatic discharges, the supplier shall have suitable workstations for this type of activity, in accordance with the requirements of the applicable technical documentation.

### **5.3.3 Requirements for seamless electrical connections**

In order to obtain the required approval, prior to the start of series production, the supplier shall submit documentation to Leonardo-SDI regarding the process application, which shall be prepared in accordance with the requirements of the applicable technical documentation. Crimping pliers shall be subject to periodic control.

## **5.4 Performance of Non-Destructive Testing<sup>3</sup> (NDT)**

Non-Destructive Testing (NDT) shall be performed by personnel qualified according to recognised international standards (UNI, ASTM<sup>4</sup> and AWS<sup>5</sup>) or according to the Supplier's internal qualification procedures approved by a Level III NDT operator according to UNI EN ISO 9712.

## **5.5 Management of supplies from sub-suppliers**

If the supplier intends to outsource the execution of special processes, it shall use sub-suppliers with third party qualifications, or use Leonardo-SDI approved special process suppliers (listed in document QUA017-T-IT-D).

In the event that the supplier does not have the in-house capabilities, or a sub-supplier supply chain recognised by Leonardo-SDI to carry out the required special process, he shall use sub-supplier s that have been previously selected by Leonardo-SDI and listed in the document QUA017-T-IT-D.

The use of sub-suppliers recognised by Leonardo-SDI does not relieve the supplier from carrying out the controls for which he is responsible.

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<sup>3</sup> Non-destructive testing (NDT) is a testing and analysis technique used to evaluate the properties of a material, component, system or the validity of a process without causing damage to the article(s) being inspected;

<sup>4</sup> American Society for Testing Materials;

<sup>5</sup> American Welding Society;

The supplier shall provide evidence that he controls the subcontracted special processes by recalling them in the subcontracting documents, and in accordance with indications of PQA004-L-IT-D. The supplier is responsible for the entire subcontracting chain and for any nonconformities detected in the chain.

The Supplier, after verification and acceptance of the work carried out by its subcontractors, will provide Leonardo-SDI evidence and quality documentation relating to the processes implemented by sub-suppliers.

The Supplier shall:

- a) include in its purchase orders the requirements of Leonardo-SDI's *Quality Requirements for the Suppliers* (PQA004-L-IT-D and referenced documents) and in the technical documentation applicable to the supply, including the request for the required certificates;
- b) reference the special process and the subcontractor in the production management documents (e.g. Manufacturing Control Plan) at the expected stage, with identification of relevant required records;
- c) deliver to Leonardo-SDI, along with the supply, certificates providing evidence for the special process subcontracted;
- d) control its suppliers using personnel with the appropriate competence.

The Supplier, following approval of the MCP by Leonardo-SDI, shall:

- e) request from the subcontractor for verification, and send to Leonardo-SDI, the documents and records applicable to the supply, in the required time and with the required contents;
- f) prescribe the possibility of access for Leonardo-SDI and its Customer to the subcontractor's production sites and supply documentation, in case of audit and acceptance activities;
- g) notify Leonardo-SDI in advance and with appropriate timing of any change of subcontractors for approval.